United Nations E/CN.3/2005/3

Economic and Social Council

Distr.: General
16 December 2004

Original: English

Statistical Commission
Thirty-sixth session
1-4 March 2005
Item 4 (a) of the provisional agenda*
Economic statistics: programme review: energy statistics

Report of the programme reviewer (Statistics Norway) on energy statistics

Note by the Secretary-General

In accordance with a request of the Statistical Commission at its thirty-fifth session,[a] the Secretary-General has the honour to transmit to the Commission the report of Statistics Norway on energy statistics. The Commission is requested to review the work undertaken in energy statistics and consider the conclusions and recommendations that are summarized in paragraph 101 of the report.

* E/CN.3/2005/1.
[a] *Official Records of the Economic and Social Council, 2004, Supplement No. 4* (E/2004/24), chap. I.A.

04-64981 (E) 170205

Report of Statistics Norway on energy statistics

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Acknowledgement: Thanks to the Palestinian Central Bureau of Statistics, the International Energy Agency and the United Nations Statistics Division for their useful contribution and comments.

I. Introduction: the need for high-quality energy statistics

1. Detailed, complete, timely and reliable statistics are essential to monitor the energy situation at the country and international levels. Energy statistics on supply, trade, stocks, transformation and demand are the basis for any sound energy policy decisions. Without energy, economic activity would be limited and restrained. Modern society uses increasingly more energy for industry, services, dwellings and transport. Meanwhile, energy consumption has started to increase significantly in developing countries, elevating world energy demand. This is particularly true for oil, which has become the most traded commodity, and economic growth is partly linked to its price.

2. In view of the role and importance of energy in world development, one would expect basic energy information to be readily available and reliable. This is not always the case and — strange as it may appear — it is precisely at a time when more and more energy is being produced, traded, transformed and consumed, when energy dependency is increasing and when greenhouse gas emissions are high on the international agenda that it has become increasingly difficult to provide a timely and reliable picture of the energy situation in many countries and therefore for the world.

3. Obtaining a clear view of the situation requires detailed and reliable data on the different steps of the production and consumption chain. This involves proper reporting mechanisms, sound verification procedures and adequate resources; in other words, it involves mature and sustained energy statistics. However, the liberalization of the energy market, budget cuts and the shortage of experienced staff have jeopardized the sustainability of some national statistics systems and the reliability of country statistics.

4. Regional and international organizations, which depend heavily on countries, face the same problems as national administrations. As a result, despite major efforts made by organizations to keep up the level of regional and international statistics there is a risk that the quality of energy statistics will decline if action is not taken quickly to reverse the current trends in resources and staffing.

5. The impact of the lower quality of energy data will be dramatic in many areas, especially as regards the oil market and the calculation of greenhouse gas emissions. Oil analysts estimate 0.5 million barrels per day (Mb/d) as the statistical variation that they can accept in assessing the global oil market situation. With a daily production of 80 Mb/d, 0.5 Mb/d corresponds to a 0.7 per cent difference. This is a very difficult target to achieve, taking into account the need for timeliness and the number of players involved in the market and given the normal variation for other commodities, such as cement or cereals, for which statistical variations reach 5 to 10 per cent.

6. Basic energy data are also the cornerstone of calculations of emissions of greenhouse gases (GHGs) and air pollutants. Given that the Kyoto Protocol sets very precise goals for reductions in GHG emissions, the error margins of 3 per cent traditionally accepted by energy statisticians, as well as the growing statistical differences between total energy supply and demand, are no longer acceptable if countries are to be able to say with any degree of certainty that emissions have fallen or increased — and by how much — over a certain time period. Furthermore, the introduction of tradable quotas for GHG emissions in many countries will

require reliable estimates of emissions and therefore reliable energy data, since considerable sums of money will be involved.

7. Energy efficiency indicators, market penetration of a specific energy or fuel, comparison between fuels, energy security and dependency, econometric models for forecasting and planning future investments are just some examples of other needs in the area of reliable energy information.

8. Consequently, there are strong imperatives and incentives at the industry and national levels to improve the quality of underlying data. All these aspects, together with rising oil prices, booming energy demand and depleting reserves, justify giving increased attention to improving international statistics on energy.

9. However, before looking at ways and means to improve international statistics, one should have a better understanding of the current situation: who the main players are, how data are collected, processed and disseminated, what problems are encountered by the players and what new challenges are emerging from the evolution of the energy market. It is only when all these factors are known that solutions can be proposed and discussed. Therefore, the present report will first consider players and problems; then move on to the challenges; and finally propose a number of recommendations.

II. The current situation in international energy statistics

A. Major players and their mandates

10. There are three main groups of players, with different mandates as well as different geographic and energy coverage.

11. The first group deals with regional energy statistics. It includes:

- The Statistical Office of the European Communities (Eurostat), covering the 25 member countries of the European Union (EU), as well as applicant countries to the EU.
- The Latin American Energy Organization (OLADE), responsible for the 26 Latin American countries.
- The Asian Pacific Energy Research Center (APERC), with 19 Asia-Pacific Economic Cooperation (APEC) member economies.
- The Economic Commission for Europe (ECE), covering 53 European member countries and two countries from North America.
- Other organizations, such as the Association of Southeast Asian Nations (ASEAN) Center of Energy (ACE), the African Energy Commission (AFREC) and the Union économique et monétaire de l'Ouest Africain.

12. The second group of organizations focuses on the monitoring and/or reporting of specific energy/fuel markets. It includes:

- The Organization of Petroleum Exporting Countries (OPEC), which covers 11 member oil-exporting countries and focuses on the monitoring and reporting of oil and gas information.

- The Food and Agriculture Organization of the United Nations (FAO) which collects information on biomass from all United Nations member countries.
- The International Atomic Energy Agency (IAEA), focusing on information on nuclear energy from its member States.
- Other organizations, such as the European Electric Association or the African Petroleum Producers Association, which focus on a specific fuel for a specific region. Such organizations as Eurostocks focus on a particular flow for a particular fuel for a particular region (in this case oil stocks in selected European countries).

13. Only a few organizations have a broader international coverage driven by their mandate to provide a global world market perspective; the principal two are the United Nations Statistics Division and the International Energy Agency (IEA) of the Organization for Economic Cooperation and Development.

- The mandate of the United Nations Statistics Division is to seek world coverage. As such, the Division collects data from about 200 countries and territories via its annual questionnaire sent to United Nations member countries.
- The initial mandate of IEA was to monitor the oil situation in OECD member countries. However, since, on the one hand, the energy market is becoming more and more global, and, on the other hand, oil is being substituted by other fuels, the statistical coverage has increased to cover all fuels in more than 130 countries worldwide.
- A number of national administrations, including the United States Energy Information Administration, publish international statistics; there are also a few energy companies which publish energy statistics for one or several particular fuels for a particular region or the world, including British Petroleum (BP), which publishes an annual *Statistics Review of the World*, and the French Commissariat à l'energie atomique, which publishes an annual booklet on nuclear power plants in the world.

B. Activities

1. Data collection, treatment, dissemination and data flows

Data collection

14. For most of the international organizations mentioned above, the data-collection approach is similar. Initially, for each country there is a national entity (usually the ministry of energy or the national statistics office) collecting, processing and disseminating energy information to meet domestic reporting and monitoring requirements. This normally defines the base and foundation used by national administrations to meet international energy statistics reporting requirements.

15. To collect available statistics, each international organization sends its annual questionnaire(s) to its member countries and countries within its statistical mandate. The level of detail required by each organization depends on the mandate and focus of the organization.

16. An important factor in the success of these data-collection activities is therefore the ability and capacity of individual countries to provide the required information based on a given set of definitions and specified methodological approach. As discussed below, this ability and capacity has been eroded in some countries.

17. In order to reduce the burden passed on to countries, some organizations have decided to harmonize their questionnaires. IEA, Eurostat and ECE are sending only one joint questionnaire to all their member countries. The United Nations Statistics Division also relies on joint data collection instead of sending its own questionnaire to these countries. More recently, APERC has taken the initiative of harmonizing the annual APEC questionnaire with the joint IEA-Eurostat-ECE questionnaires. This not only reduces the reporting burden but also provides for increased consistency between international organizations in terms of energy statistics.

Data treatment

18. In each organization, the collected information undergoes a review and validation process in the course of which reported data is checked and cross-referenced. This can include reviewing previous years' trends in data, the internal consistencies of energy flows, the verification of implicit conversion efficiencies of energy processes etc.

19. In case of discrepancies, the country's reporting administration or focal point is contacted to investigate the issue or concern and seek clarification or revisions, if needed. In the case of gaps in the data, if the country's reporting agency declines to produce estimates, the organization may decide to produce estimates for the missing data.

20. It is important to realize that the extent of the review and validation process is directly dependent on available resources within each organization, at both the national and international levels.

Data dissemination

21. There is not a "one-size-fits-all" approach to data dissemination. Each organization develops its own dissemination strategy based on such factors as its mandates, objectives, reporting obligations and financial constraints. As the deciding factors will change in time, the dissemination strategy may also evolve accordingly.

22. As a general principle, organizations should not retain the information they collect; not only should they disseminate it but they should also add value to the raw data collected. As a consequence, basic data received from countries should be shown in table or spreadsheet format, aggregated at a regional or global level, as well as processed for comparison between fuels and countries; they should also be used for preparing a set of basic or more sophisticated indicators.

23. A few examples of how selected organizations disseminate their statistics are given below.

24. **Eurostat** issues comprehensive annual and monthly energy statistics on EU member countries both electronically (the *NEWCRONOS* database, for instance) and in hard copy (*Yearly Statistics* and *Energy Balance Sheets*). As regards its pricing

policy, Eurostat has recently decided to put all its data for free on Internet. **OLADE** also publishes its data electronically and on paper; its *Sistema de Información Económica Energética* (SIEE) is available on the Internet and on CD-Rom; OLADE also publishes several books and booklets such as *Energía en Cifras* (which can also be downloaded on the Internet). **APERC** publishes two main annual publications: *APEC Energy Statistics* and the *APEC Energy Handbook*; it also provides extensive annual, quarterly data and databases as well as more recently monthly oil data on its web site. **OPEC** publishes, in hard copy and on the Internet, its *Annual Statistical Bulletin* (ASB), which contains nearly 150 pages of tables, charts and graphs detailing the world's oil and gas reserves, crude oil and product output, exports, refining, tankers, plus economic and other data. OPEC also uses and disseminates oil statistics in its *Monthly Oil Market Report*.

25. **The United Nations Statistics Division** has two flagship publications: *Energy Balances and Electricity Profiles* and *Energy Statistics Yearbook*. The *Energy Statistics Yearbook* presents annual data for about 215 countries, regions and the world on production, trade and consumption of energy: solids, liquids, gaseous fuels and electricity. In addition, per capita consumption series are also provided for all energy products. The publication *Energy Balances and Electricity Profiles*, a biennial publication, includes energy balances for some 50 countries or areas and special electricity profiles for some 80 countries or areas. The Division also disseminates an energy statistics database, with energy time series from 1950, which is available on CD or electronic files. Monthly energy statistics are also collected and disseminated in the *Monthly Bulletin of Statistics*.

26. **IEA** publishes 10 annual and 2 quarterly publications, a statistics booklet and major electronic data services. The 10 publications include 4 that cover energy statistics and balances of OECD and non-OECD countries, 5 covering the five main fuels (oil, gas, coal, electricity and renewables) and the publication *CO_2 Emissions from Fuel Combustion*. The two quarterly publications are *Energy Prices and Taxes* and *Oil, Gas, Coal and Electricity, Quarterly Statistics*. The publications give detailed information on the energy situation (production, trade, stocks, transformation and consumption) for all fuels for over 130 countries, regions and the world. IEA also publishes monthly data on oil, natural gas and electricity. Most of the time series are available on electronic format, on both CD-Rom and the Internet.

Data flows

27. There are different types of data flows: flows from companies to national administrations, flows from countries to organizations and flows between organizations. The first type of flow is proper to each country, and is mostly managed by domestic statistics laws. The second flow deals with international data collection, and has been developed in a previous paragraph. The report will then focus on the third flow, which covers transfer of information through cooperation between organizations.

28. Although many players call for more cooperation on energy statistics, there are various reasons why the direct transfer of data and information between organizations is not always easy, e.g., ownership and confidentiality, differences in definitions, units, coverage, timeliness, data quality. Some of these issues will be discussed in chapter III.

29. However, as mentioned earlier, there are examples of successful cooperation. The collaboration between IEA, Eurostat and ECE and the agreement between IEA and the United Nations Statistics Division (for IEA to provide its database on OECD countries and for the United Nations Statistics Division to provide IEA with data on countries for which IEA does not collect data) have been mentioned earlier. More generally, there are gentlemen's agreements between organizations for giving access to each other's databases.

30. Increased cooperation can also be noted between countries and organizations. For example Denmark has integrated its international reporting requirements in its national energy statistics, which secures consistency between the two sets of energy statistics.

2. Methodological work

31. The energy market is a fast-evolving market. For example, 40 years ago, there was almost no electricity produced from nuclear energy; more recently the natural gas liquids (NGL) market has started to develop, and wind and solar energy have started to draw attention; tomorrow might see a fast development of biofuels and hydrogen. As a consequence, there is an obvious need for statistics and statisticians to follow, if not to anticipate, the fast evolution of the market, not to mention some structural changes in the market, such as liberalization and mergers. The Kyoto Protocol and the close links between energy and environment constitute another reason for organizations to adapt their questionnaires and methodology.

32. However, if most of the organizations actively work on revising definitions, questionnaires and methodology, there is a compromise to be found between too-frequent revisions (and the impact on national administrations) and no revisions at all (and the risk of losing track of the evolution of the markets).

33. For example, IEA, Eurostat and ECE have adopted a five-year period to review with their member countries the need to change their joint questionnaires. A recent meeting of the Energy Statistics Working Group (ESWG) presented the opportunity to the three organizations not only to assess and discuss a suite of proposed changes to the joint questionnaires but more importantly to discuss problems faced by international organizations, and statistical offices of individual countries, to identify best practice, and to find solutions. The United Nations Statistics Division, which uses the joint IEA-Eurostat-ECE data, also participated in the meeting.

34. Another important collective step towards better harmonization was the production of the *Energy Statistics Manual* by IEA and Eurostat. The manual was disseminated a few weeks before the ESWG meeting. This reference manual covers all aspects of energy statistics, focusing on the joint IEA-Eurostat-ECE questionnaires, and complements existing United Nations manuals, such as *Energy Statistics: A Manual for Developing Countries* (1998). It is clear that there is a deficit of energy statistics knowledge, experience and expertise, and as a consequence a strong need for reference manuals to speed up the learning curve of newcomers in the energy statistics field. This point will be further discussed in the following section.

3. Training and capacity-building

35. Various training activities are carried out by the organizations.

- **The United Nations Statistics Division** organizes two or three training workshops a year, in various areas of the world, to help responding countries tackle statistical and reporting issues. For instance, in 2004, one was held in Ethiopia for East African countries and one in Lebanon for West Asian countries.
- **APEC** organizes at least one workshop a year in Tokyo for its member economies; APEC also organizes a meeting of its member countries' statisticians once a year to review the overall energy statistics situation in the APEC region.
- **Eurostat** gathers the European Union heads of energy statistics at least once a year.
- **OLADE** also tries to gather its statisticians from all Latin American countries once a year.
- **IEA** organizes workshops for its member countries, as well as training sessions for key non-OECD countries and regional organizations. Over the last two years, IEA trained statisticians from China and India and from the African Energy Commission.
- There are other organizations — which do not necessarily collect statistics — that have training programmes on energy statistics. One of the best examples is the Institut de l'énergie et de l'environnement de la Francophonie (IEPF), which is very active in helping African countries to build energy information systems.

36. However, these efforts are very much limited by availability of resources. To help offset the erosion of the ability and capacity of individual countries to report the required information, there is a need for sustained training efforts to rebuild and increase the reporting expertise and capacity of member countries and organizations.

37. In building capacity, it is crucial to recognize that good quality statistics concern not only statisticians but also policy makers, who need to understand that improved statistics will better inform the policy decision process, and therefore minimize the risk of selecting the wrong policy instrument to meet domestic or international policy objectives. In other words, policy makers need to invest in good quality statistics, as it will better service their needs.

38. Capacity-building therefore encompasses two aspects: the building-up of adequate resources to handle the current and additional tasks passed to national and international organizations in charge of statistics (top-down approach), and the improvement of the expertise in these organizations (bottom-up approach).

39. The bottom-up approach deals mainly with improving the knowledge, experience and expertise of the statisticians in place. Compared to 20 or 30 years ago, the situation has dramatically changed. Statisticians no longer try to build a career in energy statistics. After a few years spent in statistics, young professionals are attracted to other areas of work, such as analysis and policy-making. This causes a growing gap in expertise and experience.

40. Proper manuals and frequent training sessions are essential for raising and maintaining the level of competence and interest in a statistician's career. However, as noted, a lack of resources in regional and international organizations does not allow these organizations to do more in these two important fields.

41. Training efforts need to be on a continued and sustained basis. It also needs to be complemented with appropriate guidelines and support to achieve a high-quality reporting objective. Current methodological reference documents are often outdated; this is, for instance, the case for the rare documents available, such as the three key documents published by the United Nations, namely, *Energy Statistics — A Manual for Developing Countries*, *Energy Statistics: Definitions, Units of Measure and Conversion Factors*, and *Concepts and Methods in Energy Statistics, with Special Reference to Energy Accounts and Balances — A Technical Report*, in 1991, 1986 and 1982, respectively. These manuals provide guidance for the elaboration of statistics of traditional energy sources. However, as the energy market has significantly evolved since their publication, they do not account for the treatment of new energy forms or new energy technologies that have penetrated or are penetrating the market.

42. Recent efforts, such as the joint IEA-Eurostat *Energy Statistics Manual* are helping to partially fill the gap. This reference manual can be seen as a first step towards a better understanding of what energy statistics of today are about. It also highlights the need for further work on the development and harmonization of concepts and methods. The 2004 ECE *United Nations Framework Classification for Energy and Mineral Resources* report is another example of recent contributions towards this harmonization, in that particular case in giving a universally applicable scheme for classifying and evaluating energy and mineral reserves.

43. There are other activities, including establishing think-tanks and supporting pilot surveys, related to building reporting capacity in a specific field; this was for instance the approach taken by Eurostat when it launched the new questionnaires on combined heat and power and on renewables.

44. The top-down approach raises the profile of energy statistics at the highest levels in highlighting the importance of energy statistics on any sound energy policy measures (see paras. 1-9 above) and the risks impact of poor quality statistics on energy policy.

45. Energy statistics were high on the agenda of the 9th International Energy Forum, which took place in May 2004 in Amsterdam. Seventy Ministers from producing and consuming countries commended the work done by six organizations, namely, APEC, Eurostat, IEA, OLADE, OPEC and the United Nations Statistics Division, in improving global transparency on the oil market. More recently, in October 2004, the G7 Ministers asked the organizations to strengthen their effort towards greater transparency. How to translate this call into proper resources at both the country and organization levels is a difficult question for all organizations to consider.

46. The answer is in the hands of each organization. For instance, IAEA took the opportunity to raise issues related to statistics at its Governing Board meeting of October 2004. It is interesting that Governing Board members shared the concern of IEA and requested IEA to keep them informed on major problems with their own countries.

47. To summarize the current situation on international energy statistics, regional and international organizations are heavily dependent upon statistics from their member countries. However, liberalization and confidentiality, as well as lack of resources and expertise lead to issues in national statistics, and as a consequence in international statistics. The situation is far from being alarmist and is certainly better than in most fields of statistics. Nevertheless, since energy is so important in many respects, such as oil prices and environment, energy statistics must keep the level of quality they always had; in fact, recent developments, such as the Kyoto Protocol, impose further improvement in the quality, coverage and timeliness of the energy statistics.

III. Problems

A. Difficulties in data collection

48. As mentioned earlier, an important factor for successful energy statistics is the ability and capacity of individual countries to provide the required information. However, this ability and capacity has eroded in a number of countries for several reasons, which are developed in the next paragraphs.

1. Insufficient resources

49. When responding countries no longer dispose of sufficient resources for their domestic energy statistics requirements, a first level of potential distortion is created. This inevitably adds pressure to the review and validation process at the international organizations level. Similarly, when international organizations are also faced with insufficient resources, it has a significant impact on their ability and capacity to properly process countries' collected information, and jeopardizes the organization's ability to keep its energy data-collecting activities in line with a continuously evolving energy market.

50. A recent survey conducted about the situation in OECD countries shows that, in many countries, statistics offices have experienced a major reduction of their resources over the last 5 to 10 years. In some cases resources were reported to have been cut by more than half.

51. This reduction in resources also affects international organizations. For example, the United Nations Statistics Division suffered a 20 per cent reduction of the staff allocated to energy statistics during the last decade. The situation is similar in several regional organizations such as OLADE and ACE.

52. Another point of pressure on existing resources is the additional data requirements that have been, and continue to be passed to energy statistics offices over the years, without an increase in resources. They include a large spectrum of information ranging from statistics on renewables to indicators of energy efficiency and data on greenhouse gases emissions. These data are essential to targeting environmental and effective energy policies at the sector level — where they are most effective, and are necessary for the monitoring and reassessment of implemented policies.

53. As statistics are often perceived to have a low profile, it has a limited appeal to young professionals and attracts few champions. The impact of lack of resources is

therefore not only limited to the quantity of the human resources but also to the quality of these resources.

2. An evolving market

54. The liberalization of energy markets brings new challenges to energy statistics. Firstly, the multiplication of market interveners: where statisticians in the past could get detailed information on one fuel (gas or electricity) from one national utility, they now have to survey tens, if not hundreds, of companies to have a comprehensive view of a sector. Secondly, market regulations generally lead to confidentiality issues, which add to the difficulty of collecting basic information where there are few players.

55. In most countries, the legal framework for collecting statistics has not evolved to meet the new challenges inherent in energy market liberalization. Therefore, with the same level, or even fewer resources than in the past, and with statistics laws often no longer adapted to the new environment, statisticians have increasing difficulty in collecting all the necessary information on a particular sector. The consequence is more estimates and more missing data as well as longer delays in obtaining the data, and therefore a loss of information, quality and timeliness.

56. It should be noted here that organizations, such as Eurostat, are currently working on a new legal framework, adapted to a more liberalized energy market, for their member countries,. However, not all organizations have that option available to them.

B. Duplication

57. There are two issues associated with the duplication of work: harmonization in the questionnaires so that a country will have to fill out one single questionnaire and forward it to all the organizations it is a member of; and an agreement between organizations to split the processing work of the statistics of common member countries and to give free access and use to each other's data and database.

58. As can be seen in section C below, there are many methodological and definitional differences between some organizations. This will make it difficult to attain full harmonization of the questionnaires. One potential solution to this issue would be to create electronic interfaces between questionnaires, allowing a country to fill the less detailed questionnaires out of the most detailed one.

59. The division of work among organizations also implies comparable definitions and methodologies. Moreover, it also implies a shared level of confidence in the work of each other's organizations. Last but not least, such a division should not lead to any deterioration of the contacts between organizations and their member countries.

60. Despite all these conditions and as mentioned earlier, there are already good examples of cooperation among organizations to avoid duplication of work both for countries and organizations (agreement between the United Nations Statistics Division and IE. on OECD data, between the United Nations Statistics Division and OLADE on Latin American and Caribbean countries and between ECE and IEA on non-OECD ECE countries; other efforts to avoid duplication have been initiated).

C. Methodological and definitional differences

61. International energy statistics are faced with the challenge of multiple data sources, definitions, units and methodological approaches for the collection and processing of the data.

62. **Multiple data sources**. Organizations do not always have the same official contacts in countries. Some organizations rely on national statistics offices, others on energy ministries. In certain cases the data submitted by different national sources are not identical. Some organizations rely on published sources, others on questionnaires sent by official contacts.

63. **Definitions**. Since organizations have different interests and mandates, the definitions of flows and products might differ from organization to organization. A good example of such differences deals with the definition of crude oil production. Everybody knows what crude oil is, and what production means; except that when APEC, Eurostat, IEA, OLADE, OPEC and the United Nations Statistics Division tried to harmonize their definitions of this simple product and flow, they were unable to find a definition agreeable to all parties despite extensive communication on the subject. That was because crude oil, for instance, includes natural gas liquids (NGLs) for some organizations but not for others, and because production is not measured at the same point for all the organizations.

64. **Units**. Physical flows are collected in different units; to go back to the example of crude oil production, some organizations collect the flow in volume, others in mass. Moreover, the units of volume and mass differ from one organization to the other.

Conversion factors and calorific values. To pass from one unit to another, countries and organizations use a set of conversion factors and calorific values. However, these factors and values vary from country to country and organization to organization.

65. **Methodological approaches**. Each organization has its own convention when building commodity balances and energy balances. For instance, some organizations continue to use the partial substitution methodology when building their energy balances while others have adopted the physical energy content methodology. This leads, for instance, to major differences in the share of hydroelectricity in total primary energy supply.

66. Important harmonization and integration efforts will be required in the coming years to mitigate some of these definitional and methodological differences between energy statistics of the various organizations involved. As mentioned earlier, this will also include important efforts to achieve comparable data quality, data coverage and timeliness across organizations.

IV. New challenges

67. Recognizing that energy is a crucial element to economic development, it already defines the need for good quality energy data. However, as defined in the introduction, this is a time when there are strong pressure points between energy production, trade, transformation, and consumption. The world is faced with disequilibrium between energy supply and demand, increased energy

interdependence, and continuously increasing environmental concerns. These concerns and issues not only emphasize the requirement for increased data quality and level of detail, they also add tremendous pressure on timeliness. Section A below includes two examples of challenges that are high on the political agenda, one on the oil market and the other on the Kyoto Protocol. They highlight the various aspects of timeliness, quality and coverage, as well as the importance of international cooperation in meeting these challenges.

68. The spectrum of new information requirements, and therefore of as many challenges to statisticians, ranges from statistics on renewables, indicators of energy efficiency, energy security, monitoring of emerging energy flows, to greenhouse gases emissions, highlighted in section B.

A. Two examples of increased requirements for quality and timeliness

1. The example of the oil market

69. Speculators and oil market analysts blamed the lack of transparent oil statistics at the end of the 1990s when the volatility in oil prices was high. Whether this was a truthful claim or not remains a question; however, the example can be used to highlight the importance of reliable and timely data to monitor the oil market.

70. As oil is the most traded commodity, analysts always seek more coverage, more timely and more accurate data. For example, in the introduction, 0.7 per cent was mentioned as the level of precision requested for oil supply, demand and stock data.

71. As a response to the lack of oil data transparency at the end of the 1990s, energy statisticians of APEC, EUROSTAT, IEA, OLADE, OPEC and the United Nations Statistics Division embarked on an initiative to assess the monthly oil reporting capability of their member countries. They designed a small monthly oil data report, known as the Joint Oil Data Initiative (JODI) and asked member countries to complete it for the last two months. JODI has been extremely successful as the number of participating countries increased rapidly from 53 to more than 90 countries today, with the major producing and consuming countries covering almost 95 per cent of the oil market. Moreover, through the JODI, high political levels were reached: for instance, JODI was commended by many Ministers at several meetings, e.g., the 9th International Energy Forum, the G7 Finance Ministers, and others.

72. The JODI can therefore be considered as an exemplary project in terms of meeting the needs for better quality data, greater coverage and more timely oil data, as well as an excellent illustration of what can be achieved thanks to the cooperation among international organizations.

2. The example of greenhouse gas emissions

73. The Kyoto Protocol, which will be in place on 16 February 2005, set specific targets for greenhouse gases emissions reductions, which are largely associated with fossil fuel combustion. This raises an important aspect, which is the accurate reporting and monitoring of greenhouse gases emissions vis-à-vis emissions-reduction targets, and the emergence of an emissions permit trading system.

74. In the interim, the policy-making community has an immediate need for the best possible information for the rapid development of most effective domestic and international mitigation strategies. It is crucial to recognize the importance of high-quality statistics to best inform the policy-decision process, and therefore minimize the risk of selecting the wrong policy instrument to meet domestic or international policy objectives.

75. Moreover, cooperation between organizations and the Intergovernmental Panel on Climate Change (IPCC) as well as with the United Nations Framework Convention on Climate Change is essential in making sure that there is full harmonization in the definitions of products and flows as well as in the coverage of energy statistics, which constitute a large part of the statistics needed to estimate and calculate emission inventories of participating countries.

B. Other challenges

76. As noted earlier, the current trend of energy market liberalization brings new challenges to energy statistics. Energy statistics face the multiplication of market interveners, where national electric and gas utilities are now often competing with tens, if not hundreds, of companies. This not only adds to the complexity of data collection in terms of the increasing number of respondents, but also in terms of confidentiality concerns raised by respondents.

77. In the inverse situation of market concentration (mergers), confidentiality then becomes an issue of too few players. In most countries, the legal framework for collecting statistics has not evolved to meet the new challenges inherent to energy market liberalization.

78. The world energy market is also evolving rapidly in terms of energy suppliers and consumers. Strong growth has occurred in the developing economies, where data quality tends to be lower, and with a lower level of details. Raising the level of statistics in these new merging consumers and producers is another challenge passed to regional and international organizations.

79. The combination of market liberalization and strong growth in developing economies has contributed to a dramatic growth in energy trades. Energy imports and exports are increasingly more difficult to monitor, owing not only to the increase in volume, but also to trade practice phenomena, such as in-transit energy flows, increased swapping and rerouting.

80. Driven by a mix of policy objectives (e.g., environmental, economic, energy diversification), energy statistics of non-conventional energy markets will need to be further developed. This is particularly true of renewables, which are often targeted by the policy-making community as providing key mitigation opportunities. However, it is an energy market segment where significant data gaps, definitions discrepancies, and coverage deficiencies were observed. This not only applies to new renewables, such as wind and solar, but traditional ones such as biomass.

81. Biomass, which represents more than 10 per cent of the total primary energy supply in the world, is one of the most difficult fuels to monitor in terms of supply and demand. Particularly in the least developed countries, the biomass could provide up to 90 per cent of household energy consumption. There are obvious reasons for that: the use of fuel wood is remote and most of the wood is not

commercialized but collected for personal use. For environmental reasons (contribution to deforestation and desertification) and because of the possible need of fuel substitution, there is a challenge passed to statisticians to have a more precise picture of the biomass supply-demand chain not only at the world, regional and country levels, but often the local level since biomass remains a purely local market.

82. Another challenge to statistics deals with the collection of detailed data to assess energy efficiency policies: as a way to improve economic performance, and as a mitigation instrument for greenhouse gases emissions reduction, policy makers embark on energy efficiency programmes. This entails collecting very detailed data on specific end-uses (domestic hot water, for instance) as well as sound socio-economic data, which are needed to explain and understand the driving forces to changes in the energy market.

83. There are prerequisites to meeting these new challenges. The prerequisites, which will be further developed in the next section, include:

- Reassessment of the resources needed to meet the workload and objectives
- A better integration of the energy statistics community with the energy policy community
- Adapting the legal framework of energy statistics to the energy market situation
- Capacity-building and capacity to retain expertise
- Increased harmonization and integration of energy statistics activities.

V. Recommendations

84. There are three types of recommendations that should be made to the parties involved in energy statistics. The first type of recommendation applies to national administrations. As highlighted in the report, countries are the basis of all statistics published by international organizations; without sound country data, there are no sound international statistics. The second type deals with international organizations; in fact, some of these recommendations, such as the need for proper resources, are similar to those of the first type. The third type concerns the need for more international cooperation in order to reduce the burden of both countries and organizations, as well as to improve the overall quality, coverage and timeliness of international statistics.

A. National administrations

85. **Place and role of energy statistics and statisticians**. A dialogue between energy policy makers and statisticians should be ensured in countries. Policy makers need to be fully aware of the constraints and problems encountered by statisticians, and statisticians need to better understand the importance of the data they collect, process, and disseminate and be able to better recognize the policy relevance of information they process.

86. **Proper resources are essential**. There is an urgent need to reassess the current level of resources and to readjust, when needed, the balance between workload and resources. It is obvious that a major part of the problems in national statistics lies in the lack of resources.

87. **Adaptation of the legal framework**. There is also the need to adapt statistics to the new energy environment (liberalization, mergers, rapid development of trade, etc.). This includes modification of the legal framework for collecting statistics, closer cooperation with the energy industry, surveys that are more consistent with the needs of data users, etc.

88. **Expertise and experience**. Strengthening the expertise and experience of energy statisticians, and rebuilding corporate memory are also key priorities. This involves the preparation and update of reference documents on energy statistics. It also includes more frequent training of newcomers in national administrations.

89. **Attracting and retaining proper staff**. Other initiatives should be considered for raising the level of expertise and interest in the job, and therefore for raising the profile of statistics, a necessary condition for attracting and retaining highly motivated professionals.

B. Regional and international organizations

90. The recommendations to national administrations regarding the place and role of statistics and statisticians (see above), the proper level of resources, expertise and experience as well as attracting and retaining proper staff also apply to organizations. It is increasingly becoming obvious that the work in several organizations suffers from a lack of staff, and from a lack of experienced staff. As noted in the report, some of the additional requirements passed to statistics. It is difficult, even with increasing productivity, to have current statistics structures sustain the level and quality of statistics demanded at a time when the market needs more and better data.

91. International organizations have a major role to play in raising the awareness of national policy makers to the impact of lower data quality on national and international commitments. They should be the engine and the catalyst in motivating their member countries, in convincing policy makers to allocate proper resources to their national administrations, in helping the administrations in building up their statistics capacity, in adding value to countries' data, in promoting the image of regional and international statistics.

92. The time when energy statisticians were only doing number crunching should be over. Organizations are an ideal forum for statisticians to meet, discuss issues and solutions, exchange experience and best practices, etc. Some countries have already successfully integrated statistics in their policy-making process; it is the role of organizations to create interaction and synergy between their member countries.

93. To facilitate and improve data reporting, this report has already identified a few areas of work for the organizations; they include energy statistics manuals and reference documents for a better understanding of definitions, units and methodology, workshops and training sessions, more user-friendly questionnaires, closer communication, better dissemination, etc.

94. Harmonization of definitions, units and methodology leading to potential unified questionnaires should also be high on the agenda of organizations. However, as noted in previous paragraphs, this is not an obvious matter, and requires a strengthening of cooperation between organizations on international statistics.

C. Cooperation between organizations

95. Increasing cooperation between countries and organizations, harmonizing definitions, methodology and reporting between international organizations are essential to facilitating the exchange of information and reducing the international reporting burden passed to countries. This should constitute a priority for all organizations.

96. However, there are many obstacles towards this global harmonization: each organization has its own priorities and its own focus which lead to specific definitions, coverage and methodology; the quality and timeliness of the data vary widely from organization to organization; some data are confidential or sensitive.

97. Nevertheless, international cooperation is the only way to go. The Joint Oil Data Initiative has paved the way for more cooperation; this initiative, commended by many, is undoubtedly the best example of successful cooperation between 6 major organizations, more than 90 countries, as well as several key oil companies. Major progress can be achieved only by associating the three main groups of players in statistics: industry, countries and organizations.

98. **The main recommendation to be made to organizations is, therefore, that they work together as closely as possible on harmonizing definitions, units and methodology. After this necessary phase of harmonization, organizations should then start moving towards one harmonized questionnaire.** There are already several examples of joint questionnaires, and it is hoped that more will be seen in the near future.

99. Other recommendations deal with a **sharing of the processing of the countries' questionnaires between organizations (this supposes, however, a comparable level of expertise), increased transfers of data among organizations, joint manuals and reference books on statistics, common training sessions.** Several of these recommendations have already been implemented on a small scale. There is a need now to generalize and globalize these initiatives.

100. Using this report as a base, the last recommendation would be to **ask all the main organizations involved in regional and international statistics to establish a forum as soon as possible with the mandate to strengthen international cooperation. This forum should draw up as a first step a roadmap for the implementation of these recommendations and present it to the Statistical Commission in 2006.**

D. Summary of conclusions and recommendations

101. Regional and international organizations are heavily dependent upon statistics from their member countries. Liberalization and confidentiality, as well as lack of resources and expertise lead to issues both in national and international energy

statistics. Since energy is so important in many respects, such as oil prices and environment, energy statistics must keep the level of quality they always had; in fact recent developments, such as the Kyoto Protocol, impose further improvement in the quality, coverage and timeliness of energy statistics.

In order to meet these challenges, the following recommendations are made:

(a) Reassessment of the resources needed to meet increased workload and objectives;

(b) Better integration of the energy statistics community with the energy policy community;

(c) Adapting the legal framework of energy statistics to the energy market situation;

(d) Capacity-building and capacity to retain the expertise;

(e) Increased harmonization and integration of energy statistics activities of the international/regional organizations, such as:

(i) Revision and updating of the reference methodological handbooks and user manuals;

(ii) Development of methodologies to monitor new energy and fuel types, non-conventional energy markets and emerging energy flows;

(iii) Harmonization of concepts, definitions and methods used by the organizations in data collection and treatment;

(iv) Further harmonization and improvement of questionnaires with a view to developing interfaces between the more and less detailed ones;

(v) Clear agreements on sharing the work in data collection and treatment;

(vi) Clear agreements on data sharing;

(vii) Joint intensified efforts in training and capacity-building;

(f) The main organizations involved in regional and international statistics establish a forum as soon as possible with the mandate to strengthen international cooperation. This forum should draw up as a first step a roadmap for the implementation of these recommendations and present it to the Statistical Commission in 2006.